

Claims

What is claimed is:

1. A catalyst for polymerization and co-polymerization of ethylene, wherein said catalyst is  
5 produced by means of:

(i) preparing a magnesium solution by contact-reacting a halogenated magnesium compound with alcohol;

10 (ii) reacting said solution with an ester compound having at least one hydroxy group, or a phosphorus compound and a silicon compound having alkoxy groups, and then producing a solid component by adding a mixture of a titanium compound and a silicon compound thereto; and

15 (iii) reacting said solid component with an aluminum compound, and then reacting the same with a titanium compound, or a titanium compound and a vanadium compound.

2. The catalyst for polymerization and co-polymerization of ethylene according to Claim 1, wherein said ester compound containing at least one hydroxy group is an unsaturated aliphatic acid ester having at least one hydroxy group, which is selected from the group consisting of 2-hydroxy ethylacrylate, 2-hydroxy ethylmethacrylate, 2-hydroxy propylacrylate, 2-hydroxy propylmethacrylate, 4-hydroxy butylacrylate, pentaerithritol triacrylate; an aliphatic monoester or polyester having at least one hydroxy group, which is selected from the group consisting of 2-hydroxy ethyl acetate, methyl 3-hydroxy butylate, ethyl 3-hydroxy butylate, methyl 2-hydroxy isobutylate, ethyl 2-hydroxy isobutylate, methyl-3-hydroxy-2-methyl propionate, 2,2-dimethyl-3-hydroxy propionate, ethyl-6-hydroxy hexanoate, t-butyl-2-hydroxy isobutylate, diethyl-3-hydroxy glutarate, ethyl-lactate, isopropyl lactate, butyl-isobutyl lactate, isobutyl lactate, ethyl mandelate, dimethyl ethyl tartrate, ethyl tartrate, dibutyl tartrate, diethyl citrate, triethyl citrate, ethyl-2-hydroxy-30 caproate, diethyl bis-(hydroxymethyl) malonate; an aromatic ester having at least one

hydroxy group, which is selected from the group consisting of 2-hydroxy ethyl benzoate, 2-hydroxy ethyl salicylate, methyl-4-(hydroxy methyl) benzoate, methyl-4-hydroxy benzoate, ethyl-3-hydroxy benzoate, 4-methyl salicylate, ethyl salicylate, phenyl salicylate, propyl-4-hydroxy benzoate, phenyl-3-hydroxy naphthanoate, monoethylene glycol monobenzoate, diethylene glycol monobenzoate, triethylene glycol monobenzoate; or an alicyclic ester having at least one hydroxy group as in hydroxy butyl-lactone;

wherein said phosphorus compound is a compound expressed by  $PX_aR^1_b(OR^2)_c$ , or  $POX_dR^3_e(OR^4)_f$ , where X is a halogen atom; and  $R^1$ ,  $R^2$ ,  $R^3$  or  $R^4$  is a hydrocarbon of an alkyl, or alkenyl or aryl group, having 1 ~ 20 carbon atoms, each of which can be same or different from one another, with  $a + b + c = 3$ ,  $0 \leq a \leq 3$ ,  $0 \leq b \leq 3$ ,  $0 \leq c \leq 3$ ,  $d + e + f = 3$ ,  $0 \leq d \leq 3$ ,  $0 \leq e \leq 3$ , and  $0 \leq f \leq 3$ ; and

wherein said silicon compound having alkoxy groups is a compound of a general formula of  $R_nSi(OR)_{4-n}$ , where R is a hydrocarbon group having 1~12 carbon atoms, and n is a natural number of 1~3.

3. The catalyst for polymerization and co-polymerization of ethylene according to Claim 2, wherein said phosphorus compound is selected from the group consisting of phosphorus trichloride, phosphorus tribromide, diethylchlorophosphite, diphenylchlorophosphite, diethylbromophosphite, diphenylbromophosphite, dimethylchlorophosphite, phenylchlorophosphite, trimethylphosphite, triethylphosphite, tri-n-butylphosphite, trioctylphosphite, tridecylphosphite, triphenylphosphite, triethylphosphate, tri-n-butylphosphate, and triphenylphosphate.

4. The catalyst for polymerization and co-polymerization of ethylene according to Claim 2, wherein said silicone compound having alkoxy groups is selected from the group consisting of dimethyldimethoxysilane, dimethyldiethoxysilane, diphenyldimethoxysilane, methylphenylmethoxysilane, diphenyldiethoxysilane, ethyltrimethoxysilane,

vinyltrimethoxysilane,                    methyltrimethoxysilane,                    phenyltrimethoxysilane,  
methyltriethoxysilane,    ethyltriethoxysilane,    vinyltriethoxysilane,    butyltriethoxysilane,  
phenyltriethoxysilane,    ethyltriisopropoxysilane,    vinyltributoxysilane,    ethylsilicate,  
butylsilicate, or methyltriaryloxy silane.

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5. The catalyst for polymerization and co-polymerization of ethylene according to Claim 1, wherein said titanium compound is represented by a general formula of  $Ti(OR)_aX_{4-a}$ , where R is a hydrocarbon group, X for a halogen atom, and a for a natural number of  $0 \leq a \leq 4$ ; and wherein said silicon compound is represented by a general formula of  $R_nSiCl_{n-4}$ , where R is hydrogen, an aryl, alkoxy, haloalkyl or alkyl group having 1~10 carbon atoms, or a halosilylalkyl or halosilyl group having 1~8 carbon atoms, and n for a natural number of  $0 \leq n \leq 4$ .

6. The catalyst for polymerization and co-polymerization of ethylene according to Claim 5, wherein said titanium compound is a 4-halogenated titanium, which is selected from the group consisting of  $TiCl_4$ ,  $TiBr_4$ , and  $TiI_4$ ; a 3-halogenated alkoxytitanium, which is selected from the group consisting of  $Ti(OCH_3)Cl_3$ ,  $Ti(OC_2H_5)Cl_3$ ,  $Ti(OC_2H_5)Br_3$ , and  $Ti(O(i-C_4H_9))Br_3$ ; a 2-halogenated alkoxytitanium, which is selected from the group consisting of  $Ti(OCH_3)_2Cl_2$ ,  $Ti(OC_2H_5)_2Cl_2$ ,  $Ti(O(i-C_4H_9))_2Cl_2$ , and  $Ti(OC_2H_5)_2Br_2$ ; and a tetralkoxy titanium, which is selected from the group consisting of  $Ti(OCH_3)_4$ ,  $Ti(OC_2H_5)_4$ , and  $Ti(OC_4H_9)_4$ ; and wherein said silicon compound is silicon tetrachloride, or trichlorosilane, which is selected from the group consisting of methyltrichlorosilane, ethyltrichlorosilane, and phenyl-trichlorosilane; a dichlorosilane, which is selected from the group consisting of dimethylchlorosilane, diethyldichlorosilane, diphenyldichlorosilane, and methylphenyldichlorosilane; or a monochlorosilane as in trimethylchlorosilane.

7. The catalyst for polymerization and co-polymerization of ethylene according to Claim 6, wherein said titanium compound is titanium tetrachloride, and said silicon compound is silicon tetrachloride.

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8. The catalyst for polymerization and co-polymerization of ethylene according to Claim 1, wherein the amount of the mixture of said titanium compound and said silicon compound is 0.1 ~ 200 mol per mole of said halogenated magnesium compound, and the molar ratio of said titanium compound to said silicon compound in the mixture is 0.05 ~ 0.95.
9. The catalyst for polymerization and co-polymerization of ethylene according to Claim 1, wherein said aluminum compound is trialkylaluminum having an alkyl group of 1~6 carbon atoms, which is selected from the group consisting of triethylaluminum and triisobutylaluminum; an aluminum compound having one more halogen, which is selected from the group consisting of ethylaluminum dichloride, diehtylaluminum chloride, and ethylaluminum sesquichloride; or the mixture thereof.
10. The catalyst for polymerization and co-polymerization of ethylene according to Claim 1, wherein said vanadium compound is a compound with the maximum atomic valence of 4, or the maximum atomic valence of VO of a vanadyl group of 3, having a general formula of  $V(OR^4)_{4-n}X_n$ , or  $VO(OR^4)_{3-m}X_m$ , where  $R^4$  is an aliphatic or aromatic hydrocarbon group having 1~14 carbons, or  $COR^5$ , where  $R^5$  is an aliphatic or aromatic hydrocarbon group having 1~14 carbons, wherein X is-C1, Br or I; n is an integer of 0~4, or the ratio thereof; and m is an integer of 0~3, or the ratio thereof.